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AUTHOR Sigmon, Scott B.
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ABSTRACT

Social class, as reflected in socioeconomic status (SES), has such a profound influence on all aspects of performance that it is perhaps the most powerful predictor of academic achievement. Intelligence quotient (IQ) tests in one form or another have been used for quantitative assessment of academic ability since Alfred Binet first developed the concept of IQ in 1904 to help identify slow learners for placement in special curricula. Yet, children of high SES families generally have higher IQ scores than low SES children. Therefore, obtaining fair assessments of academic ability in minority children, a disproportionate number of whom are socially disadvantaged, is wrought with difficulties. Much has been written to explain why more affluent school children do better than their disadvantaged peers. The most frequently cited factors are childbearing practices that focus on discipline and language. In general, however, research results have been confusing and sometimes contradictory. Raven's Colored Progressive Matrices Scale (CPM) was developed as a culture-fair test of cognition in children. A relatively nonverbal test of spatial analogues, the CPM has been considered a panacea by some. However, a careful review of the literature reveals that high SES children generally score significantly higher on the CPM than low SES children. (MCK)

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SOCIAL INEQUALITY AND MEASUREMENT OF COGNITION IN THE SCHOOLS: FOCUSING ON RAVEN'S COLORED PROGRESSIVE MATRICES SCALE

by

Scott B. Sigmon

School Psychologist

Irvington, N.J., Public Schools

U.S. DEPARTMENT OF EDUCATION
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"Truth is more complex, multifaceted and value-determined than is the usual fact. Fact is empirical while truth is interpretative. Fact is, in itself, unrelated to value; it merely is. Truth, as the understanding-in the fullest sense-of fact, is related to value and, for that reason, more fully human."

Kenneth B. Clark (1965)

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The thesis of this paper is that social class has a profound influence on all aspects of performance, and that a fair quantitative assessment of socially disadvantaged children is wrought with difficulties but is possible. The most controversial issue in regards to quantitative measurement of school-children is IQ. The pitfalls of some seemingly culture-fair instruments will be explored, and other relevant areas will be touched upon.

I. GENERAL SOCIAL ISSUES

In order to fully understand social inequality, the concepts of social class and stratification need to be analyzed - the latter first. Social stratification implies the existence of social inequality and a hierarchy of societal levels; e.g., social classes. Blumberg (1972) points out that in America there are two pervasive but powerful myths that go side by side: American society is classless and that if persons have talent and determination they can get to the top; and yet the myths are patently contradictory, for if there is no hierarchy of classes, then there is obviously nothing to get to the top of. Karl Marx was instrumental in pointing out the importance of social classes when studying societies more than 125 years ago. Max Weber discussed stratification in terms of status, power, and class around the turn of the century emphasizing that class affects one's "life chances in the mar-

ket place." Some writers have proclaimed that social class differences are diminishing and social class is no longer a useful concept in the analysis of American society (Nisbet, 1959), or that Western societies are becoming increasingly classless (Goldthorpe et al, 1967); but Blumberg (1972) contends these authors gloss over some important areas and that inequalities which remain are significant enough so that social class continues to be one of the most powerful analytical instruments available to the sociologist.

There has been a plethora of professional work generated on why the more affluent schoolchildren do better academically than their less fortunate peers. This excerpt is typical: 'The middle-class child is better prepared for school than the working-class child because the middle-class family places more emphasis on early reading and writing (Bernstein, 1975).' There are many other reasons, a few more will be covered below. Socioeconomic status (SES) is a contemporary concept mainly related to income and alludes to social class. This passage taken from Boocock (1980) explains why SES is perhaps the key concept when looking at variables that affect schooling:

> The family characteristic that is the most powerful predictor of school performance is socioeconomic status (SES): the higher the SES of the student's family, the higher his or her academic achievement. This relationship has been documented in countless studies and seems to hold no matter what measure of status is used (for example, occupation of principal breadwinner, family income, parents' education, or some combination of these). It holds with a variety of achievement/aspiration variables, including grades, achievement test scores, retentions at grade level, course failures, truancy,

> suspension from school, dropout rates, college plans, and total amount of formal schooling. It also predicts academic honors and awards, elective school offices, extent of participation in extracurricular activities, and other indicators of "success" in the informal structure of the student society. It holds, moreover, even when the powerful variables of ability and past achievement are controlled. Finally, the relationship between family SES and academic achievement has been found in virtually every Western society for which empirical evidence is available.

Richard de Lone (1979) further accentuates this while looking more specifically at chances for higher education.

> ...school performance - grades and test scores - substantially correlate with the SES of a student's family....The higher the student's social status, the higher the probability that he or she will get high grades. Similarly, the higher the grades and test scores, the more likely an individual from any SES is to get more schooling.

Mr. de Lone credits Jencks (1972) with the idea that higher education admits students on the basis of grades and test scores and in part because those who do well in school develop a taste for more schooling. The test most widely used in conjunction with college admissions is the Scholastic Aptitude Test (SAT), here are some recent statistics on it released by the Educational Testing Service's branch (The College Entrance Examination Board, 1974) which is responsible for it [see Table 1, page 7].

There have been arguments raised and studies done that point out differences between middle-SES and lower-SES families in terms of child-rearing practices. Two of the areas most often looked at are discipline and language. At one time it was thought that strict child-rearing was best and Davis and Havighurst (1946) found that middle class families were. Some time later

permissive child-rearing was preferable when Maccoby and Gibbs (1954) determined the middle-class parents were more so than lower-class. To clear up the confusion, Bronfenbrenner (1958) noted that the middle-class was just quicker to adjust to society's newer mores. Ten years later Lewis (1968) claimed that there was no lower-class child-rearing pattern. A number of conclusions, some conflicting, can be drawn from the resultant pattern of these prominent studies. One seemingly logical but ridiculous one might even be that the lower class finally caught up in this area.

Quite a few derogatory findings have been found by most good intentioned and a few not so good intentioned social scientists doing empirical research. An example is that it was reported at one time that poor families used physical punishment more than other segments of society. Now, according to Boocock (1980) it is not the extent of it, but when; as middle class mothers use it just as frequently but she intimates they use it more appropriately. Boocock based her conclusions on the work of (Kohn, 1959) who looked at the intent - so now the poor mothers do not hit too much, they just are guilty of hitting their kids for "respectability" instead of for "internalized standards of conduct."

Many contradictory findings abound within the social sciences regarding the poor. For instance, if it were true that poor children are reared less permissively, why are they less capable of delaying gratification as some assert? The search goes on for reasons for the disparity as to why lower class students fare worse academically than their more affluent counterparts.

So when re-searchers find a class difference that is "statistically significant," they latch onto it and proclaim to the world, aha, here is the answer, or at least part of it. However, when research is done in a vacuum ignoring other crucial variables as to why these things really occur, the results are spurious and must be seen as biased as is the notion of "a culture of poverty" which is a concealed or unconscious belief in genetic inferiority. If one believes that America is a land of "equal opportunity" and "free enterprise" (this writer believes that both are myths), then hard work plus intelligence and some luck should be all it takes to make it big in America, and that those who fail are lazy, stupid, and probably constitutionally defective because of heredity. The success of a few extraordinarily talented reinforces the myth of "the American dream."

The other area often looked at for differences, previously mentioned, is language. Many researchers believe that language - and not just dialect - hampers poor and minority children's school work; and this writer feels they are probably correct in most cases, but for the wrong reasons. They often claim that poor mothers do not speak with their children as much as the middle-class do with their own, and this is attributed to there being many more children in poor families (as described in Boocock, 1980). Yet there may be even more speaking going on with other adults in the family or the neighborhood, and possibly with all of these other children. In terms of language per se and dialect, standard middle-class American-English is spoken and taught by middle-class teachers (as well as being printed in school books and used in "standardized" tests) which obviously puts low SES White and minority youngsters at a

disadvantage. But to single out inadequate mothering is again reminiscent of the "culture of poverty theory" whereby inferior persons reproduce themselves generation after generation and also Ryan's (1971) contention that the victim is often blamed.

The British sociologist Basil Bernstein (1960) has developed a theory of language dealing with "linguistic differences [which he refers to as "codes"], other than dialect," that are transmitted via social class. It is obviously biased in favor of the middle-class and is another explanation of why these schoolchildren do better in school than those of the "lower working class." He wrote:

> It is suggested that the typical, dominant speech mode of the middle class is one where speech becomes an object of special perceptual activity and a 'theoretical attitude' is developed towards the structural possibilities of sentence organization. This speech mode facilitates the verbal elaboration of subjective intent, sensitivity to the implications of separateness and difference, and points to the possibilities inherent in a complex conceptual hierarchy for the organization of experience. It is further suggested that this is not the case for members of the lower working class. The latter are limited to a form of language-use, which although allowing for a vast range of possibilities, provides a speech form which discourages the speaker from verbally elaborating subjective intent and progressively orients the user to descriptive, rather than abstract, concepts.

This theory is functional at best, and Entwisle (1970) found

> ...contrary to expectation, that slum children are apparently more advanced linguistically than suburban children at first grade.... The superiority is short-lived, however, for by third grade, suburban children, whether blue collar or upper middle class, have surpassed the inner city children.

Taking the viewpoint that school is geared more toward suburban/middle-class children, this is not surprising.

No valid discussion of social inequality would be complete without at least touching upon health care, nutrition and actual living conditions. These factors are important considerations, and turning again to Boocock (1980) for a succinct analysis:

> Clearly, severe poverty can account for children's failure even to get to school, let alone learn anything there. The congressional investigations following the urban riots of the mid-1960s highlighted the correlations between poverty and such childhood health indicators as infant mortality rates, nutritional deficiencies, disease, and mental retardation-not to mention the probability of being bitten by rats. While the direct effects of malnutrition and other health deficiencies associated with poverty have not been precisely determined, the evidence does support the common-sense belief that they detract from children's classroom performance. [Boocock refers us to McKay et al, 1978; and Cravioto, 1968, on these issues.]

TABLE 1

The Relationship of College Board Scores (SATs)

and Family Incomes (1973-4)

(Mean family income of students scoring in each range)

Students' Scores	Students' Mean Family Income
750-800	$24,124
700-749	21,980
650-699	21,292
600-649	20,330.30
550-599	19,481
500-549	18,824
450-499	18,122
400-449	17,387
350-399	16,182
300-349	14,355
250-299	11,428
200-249	8,639
Average Score: 462	Number of Students: 647,031

REFERENCES

Bernstein, B. Language and social class. British Journal of Sociology, 1960, 11, 271-276.

Bernstein, B. Class, Codes and Control, Volume 3: Towards a Theory of Educational Transmissions. London: Routledge & Kegan Paul, 1975.

Blumberg, P. The Impact of Social Class: A Book of Readings. New York: Harper & Row, 1972.

Boocock, S. S. Sociology of Education: An Introduction. Boston: Houghton Mifflin, 1980.

Bronfenbrenner, U. Socialization and Social Class through Time and Space. In E. E. Maccoby, T. M. Newcomb, and E. L. Hartley (Eds.), Readings in Social Psychology.

Clark, K. B. Dark Ghetto: Dilemmas of Social Power. New York: Harper & Row, 1965.

College Entrance Examination Board, The. College-Bound Census, 1973-4. Princeton: Educational Testing Service, 1974.

Cravioto, J. Nutritional Deficiencies and Mental Performance in Childhood. In D. C. Glass (Ed.), Environmental Influences. New York: Rockefeller University Press and Russell Sage Foundation, 1968.

Davis, A. and Havighurst, R. J. Social Class and Color Differences in Child-Rearing. American Sociological Review, 1946, II, 698-710.

de Lone, R. Small Futures: Children, Inequality, and the Limits of Liberal Reform. New York: Harcourt Brace Jovanovich, 1979.

Entwisle, D. R. Semantic Systems of Children: Some Assessments of Social Class and Ethnic Differences. In F. Williams (Ed.), Language and Poverty: Perspectives on a Theme. Chicago: Markham, 1970.

Goldthorpe, J. H.; Lockwood, D.; Bechhofer, F.; and Platt, J. The Affluent Worker and the Thesis of "Embourgeoisement": Some Preliminary Research Findings. Sociology, 1967, 1, 11-31.

Jencks, C. Inequality: A Reassessment of the Effect of Family and Schooling in America. New York: Harper & Row, 1972.

Kohn, M. L. Social Class and the Exercise of Parental Authority. American Sociological Review, 1959, 24, 352-366.

Lewis, Hylan. Child Rearing among Low-Income Families. In L. Ferman, J. Kornbluth, and A. Haber (Eds.), Poverty In America. Ann Arbor: University of Michigan Press, 1968.

Maccoby, E. E.; Gibbs, P. K.; and the staff of the Laboratory of Human Development at Harvard University. Methods of Child Rearing in Two Social Classes. In W. E. Martin and C. B. Stander (Eds.), Readings in Child Development. New York: Harcourt, Brace & Co., 1954.

McKay, H.; et al. Improving Cognitive Ability in Chronically Deprived Children. Science, 1978, 200, 270-278.

Nisbet, R. A. The Decline and Fall of Social Class. Pacific Sociological Review, 1959, 2, 11-17.

Ryan, W. Blaming the Victim. New York: Vintage, 1972.

II. INTELLIGENCE

Volumes could be written about the hotly debated hypothetical construct known as intelligence. The purpose of this brief section is a transitional one, going from general social issues to the more specific task of critically examining one specific test. The starting point here, though, will be at the beginning of the formal intelligence test movement when in 1904:

> ...the prominent French psychologist Alfred Binet was appointed to a committee that was to investigate the causes of retardation among public school pupils. As a consequence of this work, Binet saw the need for a test that would identify children who were incapable of learning the ordinary grade subjects in the standard length of time. If such children could be identified, they could then be placed in special classes where more appropriate methods could be employed and more time would be devoted to learning a subject. Binet made what proved to be an insightful basic assumption. He reasoned that a child who is a slow learner will not have acquired as much knowledge as the average child of the same age. In other words, if a child is 10 years old but only knows as much as an 8 year-old, he must be a slow learner and will need more time to learn a new subject (Lindzey, Hall, and Thompson, 1975).

This is where the concept of intelligence quotient (or IQ) originated by utilizing the formula mental age/chronological age X 100. Today, in general, makers and users of IQ tests state coolly that IQ is what IQ tests measure. While intelligence, according to Lindzey et al (1975), is the capacity of humans and other animals to deal effectively with the environment. This writer defines intelligence as problem solving ability, and there is no doubt that some are better at doing this than others so that life can be made better for themselves and/or their families regardless of the social circumstances in which they are forced to operate. The use of IQ tests can be justified since they do predict

school success and can be used for diagnosing areas of weakness for remediation.

A belief exists - and it has been well substantiated - that children of high SES generally obtain higher IQ test scores and aptitude test scores than low SES children. Some perceive this as a covert contract to make general intelligence a measure of scholastic ability and ruling-class culture (Garcia, 1972). Others believe that the more affluent attained their higher status by way of being more intelligent and conceive children who produce higher IQ test scores. Siller's (1957) research substantiates the biased claim of a class difference in conceptual abilities, while Beiser (1972) has this penetrating commentary on Siller's research:

> Careful analysis, however, shows that the effects of poverty are uneven. The statistically significant class differences in conceptual thinking are produced essentially by a subgroup within their low-status population sample, who do very poorly. When this group is removed from the comparison, class differences in conceptual ability disappear. There is, however, no similar subgroup of very poor performers in the high-status sample.

This writer does not believe either of these extreme arguments; but rather, IQ test scores are the result of an inherited predisposition combined with an opportunity to develop cognitive potential.

The Issues.

The first issue revolves around bias (Vide Williams, 1972a, for example) and the "cultural-relativity" of standardized tests in use.

> The increased criticism of school-testing programs has led to attempts to develop "culture-free" tests, which do not depend upon verbal facility or life experiences that middle-class, white children as a group are more likely to have had. There are to date few serious alternatives to the classical IQ test, and the findings of research based on them are mixed. On the positive side, the author of one culture-free test, based upon matching random forms (thus eliminating not only the factor of

> language but also the geometric shapes that are perhaps more familiar to middle-class than to lower-class children), found that the scores were closely correlated with standard IQ scores for a sample of middle-class, white children but not for a comparable sample of low-income, black children. Furthermore, the difference between the average scores on the new test for the two groups was negligible. On the negative side, other researchers have found that minority children score even lower on culture-free tests than they do on conventional IQ tests, and the results of such tests generally have not been found to be strongly correlated with school achievement (Boocock, 1980).

Williams (1972b) devised a "culture-specific" test where poor Black children fared better than other groups to make a point about the importance of test content.

The second important issue dealt with here is really two interrelated ones: (i) Is IQ something changeable? and; (ii) If it is fixed than this is because of intellectual inferiority due to biology. Lawler (1978) argues that IQ is "fluid" or developing and is not "crystallized." Arthur Jensen (1969) sees it the other way.

The third and most important issue is the resultant use of IQ scores and educational programming. If poor or minority children are seen as less intelligent, their life chances become further reduced as they become excluded from the higher forms of education when placed in "slow track" programs or even worse, in classes for the mild or "educable mentally retarded." The State of New Jersey (1980) has recognized this problem and has developed "Guidelines" to reduce the problem:

> The following guidelines have been developed to assist districts in the evaluation of linguistically and culturally different children for the purpose of classification as Educable Mentally Retarded (EMR). Traditionally, New Jersey has utilized a two dimensional definition of mental retardation. In essence a child had to exhibit significant

> deficits in both adaptive behavior and intellectual functioning in order to be classified mentally retarded. Because of the problems associated with overreliance on I.Q. scores, such scores must not be used as the primary criterion for the classification of minority children as EMR. However, appropriate assessment procedures do exist with respect to the assessment of a child's adaptive behavior and cognitive functioning.

The article from the popular press quoted below emphasizes the extent of the situation with minority children in New Jersey:

> Although there are four times as many white children as blacks in New Jersey's schools, black children are four times more likely to be placed in classes for mildly retarded students.
>
> New Jersey officials, in announcing plans Friday to eliminate the disproportionate racial imbalance in special education programs, also said Hispanic children are three times more likely than whites to be assigned to the special classes.
>
> The placement of as many as 5,500 of the more than 10,000 children who have been labeled as "educable mentally retarded" has been questioned.
>
> Public Advocate Stanley Van Ness and Education Commissioner Fred Burke said a recent analysis of students classified as "educationally handicapped" will serve as a guide for correcting placement practices in more than 600 school districts.
>
> The analysis was made by a task force of representatives of both departments.
>
> Van Ness said placement disparities for the mentally retarded were largely the result of reliance by school districts on I.Q. tests which have been ruled discriminatory by the federal courts (Bergen Record, 1981).

REFERENCES

Beiser, M. Etiology of mental disorders: Sociocultural aspects. In B. Wolman (Ed.), Manual of Child Psychopathology. New York: McGraw-Hill, 1972.

Bergen Record (author unknown). Racial balance eyed in special education. Hackensack, New Jersey; 22 February 1981.

Boocock, S. S. Sociology of Education: An Introduction. Boston: Houghton Mifflin, 1980.

Garcia, J. IQ: The Conspiracy. Psychology Today, 1972, 6, 40.

Jensen, A. R. How Much Can We Boost I.Q. and Scholastic Achievement? Harvard Educational Review, 1969, 39, 2.

Lawler, J. M. IQ, Heritability and Racism. New York: International Publishers, 1978.

Lindzey, G.; Hall, C.; and Thompson, R. F. Psychology. New York: Worth, 1975.

New Jersey, State of; Department of Education; Bureau of Special Education (author unknown). Guidelines for the Evaluation of Culturally and Linguistically Different Children for Purposes of Educable Mentally Retarded Classification. Trenton, New Jersey: 1980.

Siller, J. Socioeconomic status and conceptual thinking. Journal of Abnormal and Social Psychology, 1957, 55, 365-371.

Williams, R. L.(a) Abuses and Misuses in Testing Black Children. In R. Jones (Ed.), Black Psychology. New York: Harper & Row, 1972.

Williams, R. L.(b) The Bitch-100: A Culture-Specific Test. Journal of Afro-American Issues, 1972, 3, 103-116.

III. RAVEN'S COLORED PROGRESSIVE MATRICES SCALE

Because of the issue of test bias, contemporary psychologists - who have been intimately involved with intelligence and IQ tests since their inception - have searched for a "culture-fair" test of cognition for schoolchildren. Raven's Colored Progressive Matrices Scale (revised order, 1956, booklet form; hereafter referred to as the CPM) was thought by some to be the panacea. This notion will be examined here in this section since a rather complete search of the literature was done. The emphasis will be on socioeconomic status (SES) as this has been the major thrust throughout, but the important factors of sex and ethnicity will be explored since they are major variables that impinge upon the results of a test administration. Then, the two major CPM studies where SES data can be extracted will be scrutinized.

The CPM Scale.

The CPM is actually a test of spatial analogies. The analogies become progressively more difficult, and problem solving initially requires the ability to comprehend "serial changes" which can be grasped by young children. As the matrices become more sophisticated, recognition of "productive changes," which is the most frequent mode of response by adults, is necessary (Raven, 1956).

The CPM is an untimed test consisting of a series of designs (36) each with a piece missing. The child selects from six pieces the one that best fits the design.

Raven (1956) wrote that:

> The CPM can be used satisfactorily with people who...cannot understand

> or speak the English language, with people suffering from physical disabilities, ...or deafness, as well as with people who are intellectually sub-normal or have deteriorated. The scale as a whole can be described as a test of...clear thinking.

He cautions against the use of the CPM as a sole measure of global intelligence, and insists that it be used with a standardized test of vocabulary for an overall measure of intellectual functioning. Koppitz (1975) describes the CPM as a test of visual-perception and nonverbal reasoning. She further wrote that it is of particular value in assessing perceptual integration of youngsters with fine-motor impairment. Birkmeyer (1965) concluded that the CPM can be used with confidence to measure a child's visual-perceptual abilities and it can indicate a trend of overall ability.

So here is a test which at first glance would not seem to favor any particular ethnic, class, cultural, or gender group. There are no environmental objects present which might be more common to one group than another. There are no letter, number, or other seemingly semiological aspects. The test is not reliant upon verbal factors or dexterity. Depth perception is not even a factor, only two dimensional visual design stimuli are utilized.

SES Differences.

The evidence shows overwhelmingly that those children from more affluent backgrounds do better on the CPM than the socially disadvantaged of the same age groups.

Concerning the CPM, Sperrazzo and Wilkins (1959) wrote that it is surprising that a relatively nonverbal performance test is demonstrably sensitive to differences in SES. Cantwell (1967) found significantly better scores on the CPM

by children from a stable neighborhood of reasonable economic background than by children from less advantaged families in New York City (see Table 2 page 26). She further stated that both groups yielded similar score distribution patterns. Jensen and Rowher (1970) wrote that SES is a major variable in CPM performance. Tuddenham, Davis, Davidson, and Schindler (1958) discovered that differences between upper middle-class and working-class schools are substantial and highly significant. Sperrazzo and Wilkins (1958) established significant differences between socioeconomic levels. Green and Rowher (1971) obtained clear differences on the CPM favoring the higher groups. All the studies that dealt with SES per se as a performance factor demonstrated that higher SES children produce a higher mean CPM score over low SES children.

The regular age usage for the CPM is for children ranging from the Kindergarten year to preteens. Raven's Standard Progressive Matrices Scale (SPM) is an upward extension of the CPM. Employing the SPM, Bernstein (1959) found that English middle-class teenage boys performed better than those of lower-class homes.

Of great interest was that paired associative learning (PA) tasks with verbal noun pairs reveal virtually no SES bias as compared to the CPM. There were negligible differences on PA tasks between SES groups, but group differences on the CPM were significant (Green and Rowher, 1971). PA measures reveal a population difference only at the Kindergarten level, whereas the CPM showed a better performance by high SES students at all levels tested, which included first and third grades as well as Kindergarteners (Rowher, Ammon, Suzuki, and Levin, 1971).

Ethnicity.

Beiser (1972) wrote that:

> SES, rather than race per se, is usually considered the important variable. The points concerning race and SES raise many questions about methodology (which have not been satisfactorily answered).

Nevertheless, some researchers claim that Whites clearly obtain higher mean CPM scores than Blacks (Higgins and Sivers, 1958; Jensen, 1974, see Table 3 page 27). Jensen and Rowher (1970) further assert that the hypothesis that the White-Black difference which is mainly attributable to culture bias was not supported by their data. However, Jensen made no mention at all of matching his subjects in his huge 1974 study in Riverside, California; even though Mexican-Americans (Chicanos) and Blacks in Riverside tend to be poorer than their White neighbors as elsewhere in the USA (Mercer, 1972). Jensen (1974) also wrote that neither the CPM or the Peabody Picture Vocabulary Test (PPVT) are biased against Black schoolchildren, but the PPVT is not culture-fair for Chicanos. Jensen's (1972) position is quite obvious in terms of his personal bias, and he even offers a solution for the inequality of measured IQ via eugenics:

> Differences consistently found between groups (e. g., the 15 point difference between the mean IQ of Whites and the mean IQ of Blacks) may in fact be genetically based and that attempts to decrease these differences may necessitate employment of biological techniques rather than...education.

Other studies reveal mixed results. Sperrazzo and Wilkins (1958), using 480 St. Louis children ranging in age from 7- to 11-years from three different SES backgrounds, found that racial differences were stronger among upper- and middle-class students in favor of Whites. However, they show that there was no

significant difference between lower-class racial groups, but lower-class Whites scored slightly higher. They wrote that they were not surprised that "race differences" in "intelligence" test scores are found with a test (the CPM) that is sensitive to variations in socioeconomic background. Semler and Iscoe (1966) found that even though White subjects had higher WISC Full Scale IQ's than Blacks at all SES levels and higher CPM scores at the 7-year level in their study, Blacks performed better on the CPM at the 8- and 9-year levels.

One study found that with middle-class students, Blacks scored slightly higher than Whites on the CPM (M. G. Cline, unpublished data, personal communication; in Tulkin and Newbrough, 1968).

The IQ level for 96 Navajo Indian children with various degrees of White schooling was lower on the CPM than on Goodenough's Draw-A-Man Test scores. The correlation between these two instruments in this study is low. Poor performance on the CPM with this population is consistent with findings of other Native American groups (Norman and Midkiff, 1955).

Sex Differences.

Cantwell (1967), utilizing 1534 second through fifth grade pupils from both lower- and middle-class groups, demonstrated that boys achieved superior mean scores over girls with both SES groups and at all grade levels. Jensen (1974) found that males did better than females on the CPM in three ethnic groups (Blacks, Whites, and Chicanos). Jensen's study included 1663 subjects with an age range from 6- to 12-years. Referring to the work of Semler and Iscoe (1966), Jensen

(1971) showed a sex difference in favor of the boys, with a larger sex difference for Whites than for Blacks. This population sample had an age range of 5- to 12-years.

Kerr (1972) examined a number of determinants of visual-motor coordination and visual-perceptual reasoning in 256 5- to 9-year olds using the Bender Gestalt Test and the CPM. His results indicate that visual-motor coordination and visual-perceptual reasoning performance were significantly affected by achievement and grade level, but not by sex.

CPM Correlations To Other Tests.

Martin and Wiechers (1954) found a correlation of .91 between the WISC (Wechsler Intelligence Scale for Children) Full Scale IQ and CPM scores. Surprising though, is that the WISC Verbal IQ correlated higher (.84) than the WISC Performance IQ (.83), but only by one point. However, the Block Design Test, which is part of the Performance Scale, showed the highest correlation (.74) of any individual subtest within the whole scale. The other correlations for the remaining tests, in descending order, are: Object Assembly and Vocabulary (.73), Comprehension (.70), Arithmetic (.66), Picture Completion and Similarities (.62), Coding (.60), Picture Arrangement (.58), and Information (.47). Subjects were 100 9-year old Indiana schoolchildren, 60 boys and 40 girls, with a mean WISC Full Scale IQ of 107 that ranged from 74 to 141 and a standard deviation of 16.1. Their CPM scores ranged from 8 to 35 with a mean of 25.3 and a standard deviation of 6.5.

Birkmeyer, in two separate studies, produced mixed results between the CPM and the WISC using Spanish-speaking White and Spanish-speaking Black children.

In 1964, correlations were Full Scale .51, Verbal .41, and Performance .50 with the Blacks. Associations for the Whites were Full Scale .62, Verbal .55, and Performance .66. The following year, Black correlations were Full Scale .40 and Performance .74. With Whites, associations were Full Scale .22 and Performance .70.

Semler and Iscoe (1966) had highly similar CPM and WISC intercorrelation matrices for Whites and Blacks at age levels 7-, 8-, and 9-years.

Birkmeyer (1964) found a significant association of .51 with the Stanford-Binet Intelligence Scale and the CPM for Spanish-speaking Black children, but not with Spanish-speaking White children (only .32). Yet Higgins and Sivers (1958) found that for 789 Black and White children of low SES with an age range of 7- to 9-years who attained similar mean Stanford-Binet scores, the Black subjects scored significantly lower on the CPM. They suggested that the CPM cannot be considered a test of intelligence or a measure of "G," but a measure of a specific skill. Their findings indicate that intelligence tests heavily loaded with nonverbal items may discriminate against Black children.

The Jordan and Bennett (1957) study contains data that suggested that the CPM is of less value for lower age groups. They studied 200 children entering first grade using "the conventional upper and lower 27% technique." It was found that 22 items appear to be too difficult for the age group studied, which effectively reduces reliability since fewer items are applicable. Also pertaining to very young pupils, McNamara, Porterfield, and Miller (1969) found that the CPM is not as good as the Bender Gestalt Test for WPPSI (Wechsler Preschool and Primary

Scale of Intelligence) correlations. Obtained correlations indicated the Bender is highly correlated for performance areas on the WPPSI and may be more appropriately interchanged than the CPM for obtaining estimates of WPPSI Full Scale IQ's.

Discussion of Data in Tables 2 and 3.

Cantwell (1967) did the largest study specifically looking at SES differences in American schoolchildren. Her subjects were all living in New York City. Most of the middle-class ones were White, and most all of the working-class group were Black, but at every age level the children from the more affluent score higher.

The Jensen (1974) study was done in Riverside, California. As was already mentioned, Jensen and Rowher knew in 1970 that SES was a major variable in CPM Performance, but simultaneously asserted that the Black-White score discrepancy was not due to culture bias according to their data. The Chicano and Black children in the 1974 study were not matched for SES with the more affluent Whites. The Whites in Riverside fit the usual description of middle-class while most of the Blacks and Chicanos do not (Mercer, 1972). This writer contends that Jensen's (1974) findings are purposely misleading in regards to race and intelligence, but his results here further confirm Cantwell's regarding SES.

These are the two largest known studies on the CPM and American schoolchildren and the results are basically the same. The poorer the family, the lower the score. In fact, the lower-class children tend to perform two years or more below their middle-class counterparts at every age level. This is a substantial score discrepancy on what initially seems to be a non-biased test. There has never been a study done that shows that lower-class children do better on the CPM.

It would probably be very safe to assume that this holds for all IQ tests as well, demonstrates a class bias of IQ tests, and does not prove genetic intellectual inferiority.

Conclusion.

There are certain factors which affect CPM performance, the most prominent being socioeconomic status, in favor of the more affluent since the low SES children display a cognitive lag on the CPM. Sex also seems to be a critical factor in favor of boys, but this may be a cultural artifact because of ascribed sex roles in our society and not based upon innate male superiority for this task. Young girls often surpass boys on verbal tasks, again, possibly due to ascribed gender roles and rearing practices. The issue of ethnic superiority has not been proven, even though whites generally score better. It appears that the CPM is neither a "class-fair" or "gender-fair" test.

It seems as though paired associative learning (PA) tasks may be less SES biased than the CPM, and this possibility deserves further inquiry. However, it may be that PA tasks, when using verbal noun pairs, are a better measure of school achievement; whereas the CPM may be the best single measure of untimed, non-motor, nonverbal cognitive ability that is currently available.

It seems logical that the CPM should correlate highest with the Block Design subtest of the WISC which is basically a test of abstract spatial thought, although the CPM does not measure exactly the same mental processes since it tests the ability to respond to nonverbal analogies and may also be more complex. Along the same lines, it is not surprising that the WISC Information subtest, which

measures factual knowledge, correlates lowest among all WISC subtests.

Norms that are used across cultures or even communities are not entirely adequate due to varying "cultural exposure," which includes various educational systems, and for many purposes local norms are better suited.

There is a linear increase in CPM proficiency by both age and grade level.

The structure of an individual's thought probably is dependent upon the dominant type of activities which take place within the culture where the individual resides. This, in turn, will affect how a person will perform on a given task. Abstract thought will be more common in technological societies where theoretical thinking is valued and required.

TABLE 2

CPM Means by School Grade Level and SES[1,2]

		Middle-Class			Working-Class		
Grade	Age[3]	Mean	SD	n	Mean	SD	n
2	7	21.06	6.03	173	16.88	4.44	216
3	8	23.67	5.41	183	18.26	5.25	248
4	9	26.85	5.39	179	18.91	5.48	169
5	10	28.28	5.69	192	22.10	5.79	174
		Totals		727			807 N=1534

TABLE 2a

Ethnic Group Membership by SES[1]

By Percent	Middle-Class	Working-Class
White and Other	94	3
Black	3	94
Puerto Rican	3	3
Totals	100	100

[1]Cantwell (1967), New York City, New York.

[2]CPM Administered during October and November.

[3]Grade level converted to age equivalence by using a constant of five plus grade by this writer for comparison purposes with Table 3 on next page.

TABLE 3

CPM Means by Ethnicity and Age[1]

Age	Ethnic Group: White			Black			Chicano		
	Mean	SD	n	Mean	SD	n	Mean	SD	n
6	14.6	4.1	91	11.9	3.0	64	12.6	4.0	110
7	18.7	5.2	143	15.0	4.6	76	14.5	4.0	84
8	23.1	6.3	79	15.4	5.9	66	16.6	5.1	91
9	25.8	6.5	96	18.7	5.4	42	19.2	6.4	89
10	27.3	5.2	83	20.0	5.8	55	21.2	6.3	83
11	28.4	4.9	71	22.6	7.0	45	24.0	5.6	81
12	29.0	6.8	69	24.4	7.7	27	25.8	7.0	68
Totals			638			381			644 N=1663

TABLE 3a

Subjects by Sex and Ethnicity[1]

By Number	Male	Female	Totals
White	333	305	638
Black	183	198	381
Chicano	334	310	644
Totals	850	813	1663

[1]Jensen (1974), Riverside, California.

REFERENCES

Beiser, M. Etiology of mental disorders: Sociocultural aspects. In B. Wolman (Ed.), Manual of Child Psychopathology. New York: McGraw-Hill, 1972.

Bernstein, B. Language and Social Class. British Journal of Sociology, 1959, 10, 311-326.

Birkmeyer, P. The relationship between the Colored Progressive Matrices and individual intelligence tests. Psychology In the Schools, 1964, 1, 309-312.

Birkmeyer, P. The relation between Colored Progressive Matrices and the Wechsler Intelligence Scale for Children. Psychology In the Schools, 1965, 2, 278-280.

Cantwell, Z. M. The performance of American Pupils on the Coloured Progressive Matrices. British Journal of Educational Psychology, 1967, 37, 389-390.

Court, J. H. Researcher's Bibliography for Raven's Progressive Matrices and Mill Hill Vocabulary Scales. Bedford Park, South Australia: The Flinders University, 1974; and Supplement No. 4, 1976.

Green, R. and Rowher, W. D. SES differences on learning and ability tests in Black children. American Educational Research Journal, 1971, 8, 601-609.

Higgins, C. and Sivers, C. H. A comparison of Stanford-Binet and Colored Progressive Matrices IQ's for children with low SES. Journal of Consulting Psychology, 1958, 22, 465-468.

Jensen, A. R. and Rowher, W. D. An Experimental Analysis of Learned Abilities In Culturally Disadvantaged Children. Report, U. S. Office of Economic Opportunity, 1970.

Jensen, A. R. The race X sex X ability interaction. In R. Cancro (Ed.), Intelligence: Genetic and Environmental Influences. New York: Grune and Straton, 1971.

Jensen, A. R. Genetics and Education. New York: Harper and Row, 1972.

Jensen, A. R. How biased are culture-loaded tests? Genetic Psychology Monographs, 1974, 90, 185-244.

Jordan, T. E. and Bennett, C. M. An item analysis of the Colored Progressive Matrices (1947). Journal of Consulting Psychology, 1957, 21, 222.

Kerr, A. S. Determinants of performance of the Bender Gestalt Test and Raven's Progressive Matrices (1947) Test. Journal of Learning Disabilities, 1972, 5, 219-221.

Koppitz, E. M. The Bender Gestalt Test for Young Children, Volume II. New York: Grune and Stratton, 1975.

Martin, A. W. and Wiechers, J. E. Raven's Colored Progressive Matrices and the WISC. Journal of Consulting Psychology, 1954, 18, 143-144.

McNamara, J. R.; Porterfield, C. L.; and Miller, L. E. The relationship of the Wechsler Preschool and Primary Scale of Intelligence with the Colored Progressive Matrices (1956) and the Bender Gestalt Test. Journal of Clinical Psychology, 1969, 25, 65-68.

Mercer, J. R. IQ: The lethal label. Psychology Today, 1972, 6, 44.

Norman, R. D. and Midkiff, K. L. Navajo children on Raven's Progressive Matrices and Goodenough's Draw-A-Man Tests. Southwestern Journal of Anthropology, 1955, 11, 129-136.

Raven, J. C. Guide to Using the Coloured Progressive Matrices (Sets A, Ab, B; Revised Order). London, England: H. K. Lewis, 1956.

Rowher, W. D.; Ammon, M. S.; Suzuki, N.; and Levin, J. R. Population differences and learning proficiency. Journal of Educational Psychology, 1971, 62, 1-14.

Semler, I. J. and Iscoe, I. Structure of intelligence in Negro and White children. Journal of Educational Psychology, 1966, 57, 326-336.

Sperrazzo, G. and Wilkins, W. L. Further normative data on the Progressive Matrices. Journal of Consulting Psychology, 1958, 22, 35-37.

Sperrazzo, G. and Wilkins, W. L. Racial differences on Progressive Matrices. Journal of Consulting Psychology, 1959, 23, 273-274.

Tuddenham, R. D.; Davis, L.; Davidson, L.; and Schindler, R. An experimental group version for schoolchildren of the Progressive Matrices. Journal of Consulting Psychology, 1958, 22, 30.

Tulkin, S. R. and Newbrough, J. R. Social class, race, and sex differences on the Raven (1956) Standard Progressive Matrices. Journal of Consulting and Clinical Psychology, 1968, 32, 400-406.

IV. PUTTING IT ALL TOGETHER

Professionals working in the schools must expect to see poor children as a group score lower on tests with national norms. More leeway has to be accorded a lower-class child before placement in a slow track or retarded class is considered. Hence, local norms are necessary and no school test instrument is valid without competent interpretation, especially in the area of knowing where certain tests have built-in biases and for whom.

The educational establishment needs to insure that children have developed learning strategies before they are expected to develop subject or task proficiency. Since it is a well documented fact that poor children lag behind the more affluent academically and this writer believes it is not because of intelligence, they are, among other things, probably less well prepared. Benjamin S. Bloom (1980) talks about "cognitive entry characteristics." He says these are the specific knowledge, abilities, or skills that are essential prerequisites for the learning of a particular school subject or a particular learning task. It is important that someone so influential as Professor Bloom should emphasize this; but older students have called these "study skills" or "readiness." Boocock (1980) directly addresses the issue of the middle-class having the mental tools and preparedness for school.

> The middle-class family is usually better able to provide the books, play materials, trips to zoos and farms, and other stimuli that prepare them for the student role, and they may even provide coaching in school related skills and tasks.

Society as a whole is the major problem with education, not the methods used or the tests administered. The problem is situational. How can a child who lives in squalor be expected to care about school? How can even a master teacher moti-

vate a classroom of students who cannot foresee any personal future benefits from formal education? Band-aid measures of social reform have not really helped very much to improve educational opportunity or decrease the number of socially disenfranchised poor over the past 150 years in America (de Lone, 1972). Bowles and Gintis (1976) contend that more revolutionary changes of the entire social order in the form of a redistribution of wealth are necessary before any real improvements can be made. There are many inequities within our society that need changing. It is the institutions which are unjust or no longer serve the original intended purposes that must be changed. Institutions have a way of perpetuating themselves. Changing the institutions will improve society. Nothing will have as great a positive influence on child development as better living conditions, which requires changing the social structure. When this happens, educational performance in general and test taking "ability" in particular will improve. This change must be done through politics.

REFERENCES

Bloom, B. S. All Our Children Learning. New York: McGraw-Hill, 1980.

Boocock, S. S. Sociology of Education: An Introduction. Boston: Houghton Mifflin, 1980.

Bowles, S. and Gintis, H. Schooling In Capitalist America: Educational Reform and the Contradictions of Economic Life. New York: Basic Books, 1976.

de Lone, R. Small Futures: Children, Inequality, and the Limits of Liberal Reform. New York: Harcourt Brace Jovanovich, 1979.